Trend Study 10-10-00

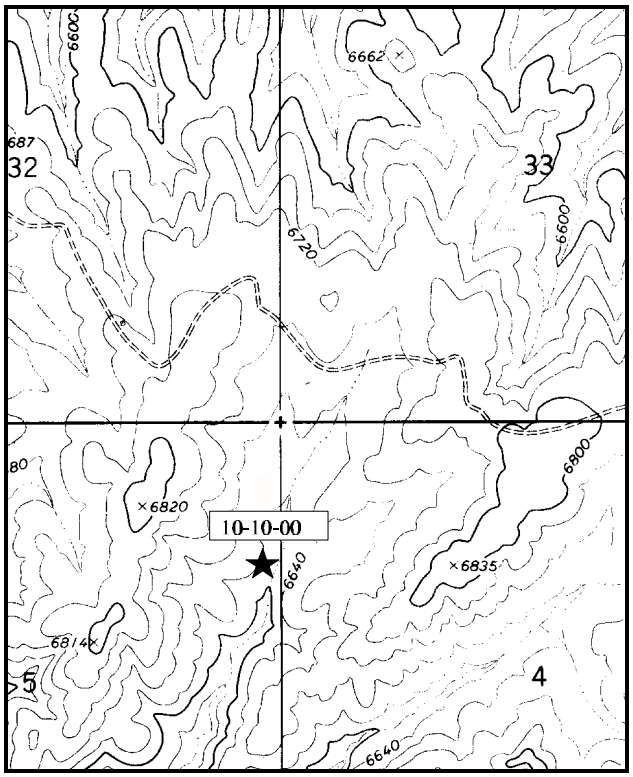
Study site name: Sunday School #1 . Range type: Fourwing Saltbush .

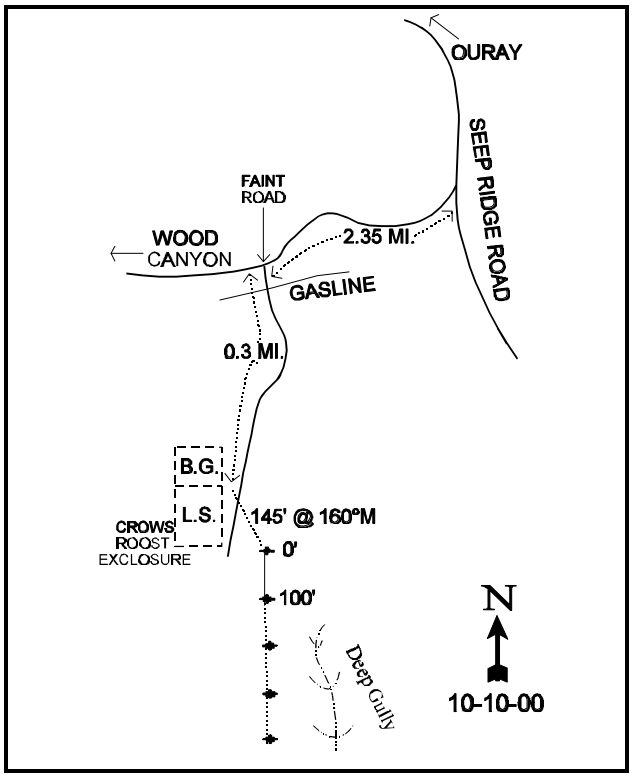
Compass bearing: frequency base line 182°M .

First frame placement on frequency belts 5 feet. Frequency belt placement; line 1 (11 & 95ft), line 2 (34ft), line 3 (59ft), line 4 (71ft).

LOCATION DESCRIPTION

From the Seep Ridge Road, turn onto the Wood Canyon/Willow Creek road and proceed west 2.35 miles. Turn left onto a jeep trail and go 0.3 miles to the Crows Roost Exclosure. The study site is on the east side of the exclosure. The 0-foot baseline stake is 29 paces from the SE corner of the big game exclosure, at a bearing of 160°. The frequency baseline runs south from there, parallel to the livestock exclosure fence. The study is marked by 2-foot tall green metal fenceposts.





Map Name: Bates Knolls

Diagrammatic Sketch

Township 14S , Range 22E , Section 5

UTM. 4388016.158 N, 631433.688 E

DISCUSSION

Trend Study No. 10-10 (16A-10)

The Sunday School trend study is located in a fourwing saltbush/big sagebrush draw adjacent to the Crows Roost Exclosure on BLM land. The study site is at an elevation of 6,650 feet with a southeast aspect. The wide draw drains to the south, although the bottom of the draw is relatively flat. The allotment is used by cattle each winter with a rotational deferred system of grazing from November 1 through April 30. Few deer and elk pellet groups were encountered in 1988 and no pellet groups were found in 1995. Pellet group transect data from 2000 indicate light use by wildlife with an estimated 3 deer days use/acre (8 ddu/ha) and 20 elk days use/acre (49 edu/ha). Cattle use is estimated at 19 cow days use/acre (47 cdu/ha).

The clay loam soil on the site is moderately deep and well-drained. Soil reaction is slightly alkaline (pH of 7.7). Effective rooting depth is estimated at almost 18 inches with an average temperature of 58°F at 18 inches. A stoniness profile estimated from penetrometer readings shows the majority of rock to occur 12 inches or deeper in the profile. With the dense vegetative cover on the study site, there is very little erosion, except along cattle trails. A gully in the middle of the draw was reported to be 10 feet deep in 1988 with steep banks. In 1995, it was only about 4 feet deep with vegetation growing in the bottom. Ground cover characteristics changed somewhat in 2000 with average cover from vegetation decreasing, while cover from litter and bare ground increased. The increase in litter was slight with bare ground increasing substantially.

Fourwing saltbush and sagebrush are large and vigorous on this site. In terms of numbers however, the incredible abundance of fringed sagebrush and winterfat appeared to dominate the understory in 1988. Yet, in 1995 this was not the case with the much larger sample size and better sampling design the estimates for shrub density are much more representative for discontinuous and/or clumped shrub distributions. In 2000, fringed sagebrush is estimated at 9,660 plants/acre and winterfat is estimated at 7,380 plants/acre. The populations of both species are composed mostly of mature plants that show mostly light use and good vigor. Winterfat displays excellent growth and seed production.

In 1988 and 1995, all sagebrush were classified as basin big sagebrush. In 1988, basin big sagebrush was estimated at 200 young plants/acre. With the larger sample used in 1995, estimated density was 2,700 plants/acre. In 2000, big sagebrush was split into basin big sagebrush which is estimated at 300 plants/acre, and Wyoming big sagebrush which is estimated at 1,480 plants/acre. The basin big sagebrush is more common near the bottom of the drainage where are soils are deeper. Wyoming big sagebrush becomes more dense as you move out of the drainage bottom and up the slope. The population of basin big sagebrush is mostly mature, lightly utilized plants. One third of the population had poor vigor in 2000. Mature plants average nearly 4 feet in height with a 4 foot crown. The Wyoming big sagebrush population is comprised mostly of mature plants. Percent decadency is low at 3%. Use is mostly light with 12% of the population displaying poor vigor. Average leader growth in 2000 is estimated at 5 inches.

Fourwing saltbush had as estimated density of 1,333 plants/acre in 1988, increasing to 1,860 plants/acre in 1995, and 2,200 plants/acre in 2000. Currently, fourwing saltbush provides 27% of the total browse cover. Utilization was reported as mostly light in 1988 and 1995, with 47% of the population displaying poor vigor in 1995. The stand appeared to be moving to an increasingly decadent condition in 1995 with 80% of the population being classified as decadent and 59% of these being classified as dying. However in 2000, the condition of fourwing is improving as decadency decreased to 27%, no decadent plants were classified as dying, while no plants were classified as having poor vigor. The high amount of decadence in 1995 could be explained by the fact that fourwing saltbush is susceptible to winter injury and there was an extremely harsh winter during 1992-93. Also, this species is fairly short-lived (20-30 years) and many older plants may be reaching the end of their life span. With the mild winters in the past several years, condition seems to be improving. No seedlings

and few young have been encountered during any reading. Use increased to a mostly moderate level in 2000 (43%) with 5% of the population showing heavy use. Average leader growth was estimated at 3-4 inches in 2000.

The herbaceous understory was dominated by annual species in 1995 as cheatgrass and tansy mustard made up 88% of the herbaceous cover and 64% of the total vegetative cover. Due to the unusually wet spring of 1995, tansy mustard was 2 to 3 feet tall. Currently, annuals are minimal with cheatgrass decreasing to less than 1% cover, and tansy mustard not being sampled in 2000. This drastic decrease in annuals is due to the drought experienced in the fall, winter, and summer of 1999-2000. Thickspike wheatgrass was the only abundant perennial grass and scarlet globemallow was the only abundant perennial forb in 1995. Thickspike significantly increased in 2000 as did globemallow. Perennial grasses and forbs significantly increased in sum of nested frequency in 2000.

1988 APPARENT TREND ASSESSMENT

Basal vegetative cover is high for this type of site at 7%. Litter cover is also fairly high at 55% and found mostly under the shrubs. The site is dominated by annual species with percent bare ground moderately high at 28%. Rock fragments are exposed as pavement (9.5%), although they are not concentrated. Soil trend appears stable. The key browse, basin big sagebrush, fourwing saltbush, and winterfat have low decadency rates, light utilization, and good vigor. The herbaceous understory consists mostly of annuals but thickspike wheatgrass, blue grama, and Sandberg bluegrass are fairly abundant. Perennial forbs are lacking and consist primarily of one species, scarlet globemallow.

1995 TREND ASSESSMENT

Soil trend appears stable. Percent bare ground has declined from 28% to 21%. Litter cover also declined, but this has been the general trend with the extended drought. Due to the abundant herbaceous cover (mostly annuals), erosion is minimal. Overall, the browse trend is considered stable, but guarded. Fourwing saltbush has a high percentage of decadent plants (80%) and nearly half of the population displays poor vigor (47%). In the nearby Crow's Roost Exclosure, decadent fourwing were also noted in both the total and livestock exclosure. This increased decadency is not related to use, as only 13% of the mature plants have moderate to heavy use. Fourwing saltbush can be damaged by extended severe drought in association with a severe winter (cold with heavy snow) which took place in 1992-93. It should also be noted that even under ideal conditions fourwing saltbush has a fairly short life span of 20 to 30 years. The replacement of the older plants with younger ones is almost impossible when they are competing against a very dense population of winter annuals. Trend for winterfat appears stable, with only a small increase in moderate to heavy use than was reported in 1988 (0% vs 8%). Winterfat within the exclosure were larger and more vigorous than those sampled outside. Basin big sagebrush now provides 37% of the browse cover with good vigor, good reproductive potential, and a robust percentage of young plants. The great change in density for fringed sagebrush is most likely a reflection of the much larger, better distributed sample used in 1995. The herbaceous understory trend is down and in poor condition. The fairly numerous perennial grasses, thickspike wheatgrass and blue grama, have sum of nested frequency values that have declined significantly. The most numerous perennial forb, scarlet globemallow, has also decreased significantly. Sum of nested frequency of perennial grasses declined 59% while frequency of perennial forbs decreased 42%. Cheatgrass and annual forbs dominate the understory by providing 91% of the total herbaceous cover. Due to the wet spring, tansy mustard was very robust and abundant even within the exclosure.

TREND ASSESSMENT
soil - stable (3)
browse - stable, but guarded because of the high percent decadency for fourwing saltbush which provides 23% of the total browse cover (3)
herbaceous understory - down and dominated by annuals (1)

2000 TREND ASSESSMENT

Trend for soil is slightly down. Percent cover for bare ground increased from 21% to almost 36% in 2000. Percent cover of vegetation also decreased while litter cover remained nearly stable. Although the increase in bare ground and decrease in vegetative cover is due to the drastic decrease in annuals, cheatgrass is fairly good at holding soils and is better than having bare soil. Trend for browse is stable overall. Fourwing saltbush shows increased use, but greatly improved vigor. Percent decadency decreased from a high of 80% in 1995 to a moderate level in 2000 at 27%. Recruitment (# of young) remains low at 6%. Big sagebrush was split into basin big sagebrush and Wyoming big sagebrush in 2000. Use on both subspecies is mostly light with low decadency. However, poor vigor occurred in 33% of the basin big sagebrush population and 12% of the Wyoming big sagebrush population. Trend for the herbaceous understory is up. Annual species decreased in 2000 due to drought, with sum of nested frequency for perennial species increasing.

TREND ASSESSMENT
soil - slightly down (2)
browse - stable (3)
herbaceous understory - up (5)

HERBACEOUS TRENDS --
Herd unit 10 , Study no: 10

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'88	'95	'00	'88	'95	'00	'95	'00
G	Agropyron dasystachyum	$_{b}$208	$_{a}$119	$_{b}$247	62	46	76	1.43	10.67
G	Agropyron spicatum	$_{a}$-	$_{b}$9	$_{a}$-	-	4	-	.09	-
G	Bouteloua gracilis	$_{c}$177	$_{a}$22	$_{b}$97	70	11	39	.18	1.68
G	Bromus tectorum (a)	-	$_{b}$252	$_{a}$82	-	80	33	10.79	.53
G	Poa fendleriana	$_{a}$-	$_{a}$-	$_{b}$23	-	-	7	-	.21
G	Poa secunda	$_{b}$20	$_{ab}$16	$_{a}$3	11	7	1	.10	.00
Total for Annual Grasses		0	252	82	0	80	33	10.79	0.53
Total for Perennial Grasses		405	166	370	143	68	123	1.81	12.57
Total for Grasses		405	418	452	143	148	156	12.61	13.10
F	Delphinium spp.	-	1	-	-	1	-	.00	-
F	Descurainia pinnata (a)	-	$_{b}$302	$_{a}$-	-	93	-	19.10	-
F	Erigeron eatonii	$_{a}$1	$_{b}$18	$_{a}$-	1	6	-	.54	-
F	Lappula occidentalis (a)	-	$_{b}$88	$_{a}$44	-	33	18	.39	.16
F	Machaeranthera canescens	$_{b}$9	$_{a}$-	$_{a}$-	6	-	-	-	-
F	Phlox longifolia	15	28	13	6	12	5	.11	.10

Type	Species	Nested Frequency			Quadrat Frequency			Average Cover %	
		'88	'95	'00	'88	'95	'00	'95	'00
F	Ranunculus testiculatus (a)	-	$_{b}$84	$_{a}$21	-	28	6	.70	.10
F	Sphaeralcea coccinea	$_{c}$202	$_{a}$84	$_{b}$142	76	37	53	.63	3.08
Total for Annual Forbs		0	474	65	0	154	24	20.20	0.27
Total for Perennial Forbs		227	131	155	89	56	58	1.28	3.18
Total for Forbs		227	605	220	89	210	82	21.48	3.45

Values with different subscript letters are significantly different at % = 0.10 (annuals excluded)

BROWSE TRENDS --
Herd unit 10 , Study no: 10

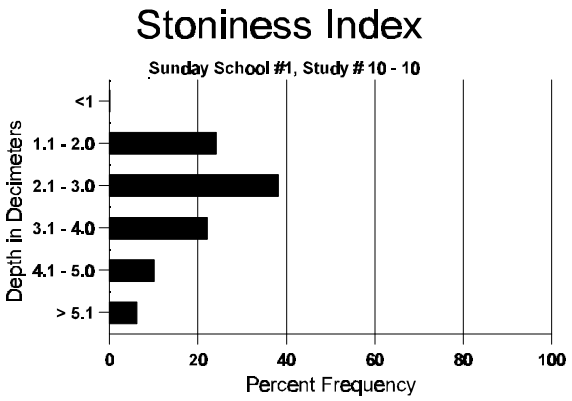
Type	Species	Strip Frequency		Average Cover %	
		'95	'00	'95	'00
B	Artemisia frigida	44	79	1.78	3.60
B	Artemisia tridentata tridentata	47	9	4.55	.91
B	Artemisia tridentata wyomingensis	0	33	-	7.09
B	Atriplex canescens	55	53	2.83	5.23
B	Ceratoides lanata	55	61	3.23	2.85
Total for Browse		201	235	12.39	19.71

BASIC COVER --
Herd unit 10 , Study no: 10

Cover Type	Nested Frequency		Average Cover %		
	'95	'00	'88	'95	'00
Vegetation	376	346	7.00	49.70	36.77
Rock	67	22	.25	.27	.06
Pavement	128	252	9.50	2.63	3.00
Litter	380	365	55.00	40.40	42.09
Cryptogams	20	30	.50	.03	.36
Bare Ground	304	317	27.75	21.33	35.75

SOIL ANALYSIS DATA --
Herd Unit 10, Study # 10, Study Name: Sunday School #1

Effective rooting depth (inches)	Temp °F (depth)	pH	%sand	%silt	%clay	%0M	PPM P	PPM K	dS/m
17.75	58.4 (18.11)	7.7	28.0	39.4	32.6	2.4	10.1	409.6	0.6



PELLET GROUP FREQUENCY --
Herd unit 10 , Study no: 10

Type	Quadrat Frequency		Pellet Transect	
	'95	'00	Pellet Groups per Acre '00	Days Use per Acre (ha) '00
Rabbit	3	38	687	N/A
Elk	-	11	261	20 (50)
Deer	-	6	44	3 (9)
Cattle	3	6	226	19 (47)

BROWSE CHARACTERISTICS --
Herd unit 10 , Study no: 10

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia frigida																		
S	88	1985	-	-	-	-	-	-	-	-	1985	-	-	-	132333			1985
	95	442	-	-	-	-	-	-	-	-	444	-	-	-	8880			444
	00	17	-	-	-	-	-	-	-	-	17	-	-	-	340			17
Y	88	940	-	-	-	-	-	-	-	-	940	-	-	-	62666			940
	95	34	-	-	-	-	-	-	-	-	34	-	-	-	680			34
	00	67	-	-	-	-	-	-	-	-	67	-	-	-	1340			67
M	88	479	-	-	-	-	-	-	-	-	479	-	-	-	31933	7	5	479
	95	66	-	-	1	-	-	-	-	-	67	-	-	-	1340	7	5	67
	00	415	-	-	-	-	-	-	-	-	415	-	-	-	8300	5	8	415
D	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
	00	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'88	00%	00%	00%	-98%
'95	00%	00%	.98%	+79%
'00	00%	00%	.20%	

Total Plants/Acre (excluding Dead & Seedlings)				
'88	94599	Dec:	0%
'95	2040		1%
'00	9660		0%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Artemisia tridentata tridentata																		
S	88	26	-	-	-	-	-	-	-	-	26	-	-	-	1733			26
	95	21	-	-	-	-	-	-	-	-	21	-	-	-	420			21
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
Y	88	3	-	-	-	-	-	-	-	-	3	-	-	-	200			3
	95	57	1	-	-	-	-	-	-	-	58	-	-	-	1160			58
	00	1	-	-	-	-	-	-	-	-	1	-	-	-	20			1
M	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	95	57	13	4	-	-	-	-	-	-	74	-	-	-	1480	20	26	74
	00	13	-	-	-	-	-	-	-	-	9	-	4	-	260	47	45	13
D	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	1	1	1	-	-	-	-	-	2	-	-	1	60			3
	00	1	-	-	-	-	-	-	-	-	-	-	-	1	20			1
X	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'88	00%	00%	00%	+93%
'95	11%	04%	.74%	-89%
'00	00%	00%	33%	

Total Plants/Acre (excluding Dead & Seedlings)				
'88	200	Dec:		0%
'95	2700			2%
'00	300			7%

Artemisia tridentata wyomingensis

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
S	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	00	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
Y	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	00	7	-	-	-	-	-	-	-	-	7	-	-	-	140			7
M	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	00	55	4	-	6	-	-	-	-	-	57	-	8	-	1300	25	31	65
D	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	00	1	1	-	-	-	-	-	-	-	1	-	1	-	40			2
X	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	60			3

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'88	00%	00%	00%	
'95	00%	00%	00%	
'00	07%	00%	12%	

Total Plants/Acre (excluding Dead & Seedlings)				
'88	0	Dec:		0%
'95	0			0%
'00	1480			3%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Atriplex canescens																		
Y	88	2	-	-	-	-	-	-	-	-	2	-	-	-	133			2
	95	3	-	-	-	-	-	-	-	-	3	-	-	-	60			3
	00	5	2	-	-	-	-	-	-	-	7	-	-	-	140			7
M	88	18	-	-	-	-	-	-	-	-	18	-	-	-	1200	31	28	18
	95	13	1	-	1	-	1	-	-	-	16	-	-	-	320	18	26	16
	00	34	28	2	8	1	-	-	-	-	73	-	-	-	1460	18	24	73
D	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	39	2	5	19	2	1	6	-	-	30	-	-	44	1480			74
	00	9	11	4	1	5	-	-	-	-	30	-	-	-	600			30
X	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	20			1
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'88	00%	00%	00%	+28%
'95	05%	08%	47%	+15%
'00	43%	05%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'88	1333	Dec:	0%
	'95	1860		80%
	'00	2200		27%

Ceratoides lanata																		
S	88	1	-	-	-	-	-	-	-	-	1	-	-	-	66			1
	95	2	-	-	-	-	-	-	-	-	2	-	-	-	40			2
	00	6	-	-	-	-	-	-	-	-	6	-	-	-	120			6
Y	88	43	-	-	-	-	-	-	-	-	43	-	-	-	2866			43
	95	29	-	-	-	-	-	-	-	-	29	-	-	-	580			29
	00	19	-	2	-	-	-	-	-	-	21	-	-	-	420			21
M	88	98	-	-	-	-	-	-	-	-	98	-	-	-	6533	9	3	98
	95	325	12	15	5	-	-	-	-	-	357	-	-	-	7140	10	10	357
	00	276	65	1	4	-	-	-	-	-	346	-	-	-	6920	7	8	346
D	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0			0
	95	30	-	-	-	-	-	-	-	-	30	-	-	-	600			30
	00	-	-	2	-	-	-	-	-	-	2	-	-	-	40			2

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor	%Change
'88	00%	00%	00%	-11%
'95	03%	04%	00%	-11%
'00	18%	01%	00%	

Total Plants/Acre (excluding Dead & Seedlings)				
	'88	9399	Dec:	0%
	'95	8320		7%
	'00	7380		1%

AGE	YR	Form Class (No. of Plants) 1	2	3	4	5	6	7	8	9	Vigor Class 1	2	3	4	Plants Per Acre	Average (inches) Ht.	Cr.	Total
Opuntia spp.																		
M	88	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0
	95	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	3	0
	00	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	0

% Plants Showing	Moderate Use	Heavy Use	Poor Vigor
'88	00%	00%	00%
'95	00%	00%	00%
'00	00%	00%	00%

%Change

Total Plants/Acre (excluding Dead & Seedlings)				
'88	0	Dec:	-
'95	0		-
'00	0		-